

EVALUATING THE LEVEL OF CLOTHES HARMONISATION

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ABSTRACT: Aesthetic garment quality is one of the most important problems of the apparel design. Fashion designer has a need in some numerical methods to evaluate the level of harmonization in order to reveal the weaknesses in the garment design. Method of complex assessment of aesthetic quality in clothes design is based on the calculation of the weighting factors of unit indexes of aesthetic quality. Compiled list of indexes which characterise aesthetic garment quality is represented in the table form. The weighting factors of the indexes were calculated. Sequence of actions for the evaluation the level of harmonization is presented with examples of women's outfits.

Keywords: Harmonization, Aesthetic quality, Index, Aesthetic requirements

1. INTRODUCTION

Nowadays the life cycle of fashion items are shortened and the items are being replaced within a very short period to fulfill consumers' needs. Consumer needs can be met by determining their functional, expressive and aesthetic requirements. Aesthetic garment quality is one of the most important problems of the apparel design in Ukraine. This is complex problem because it is related to all stages of the design process. Aesthetic quality is usually achieved as a result of harmonization an outfit's colors, shapes, fabrics and proportions. To harmonize means to bring things into harmony, or to make things compatible. However, the ability to harmonize an outfit's features is depended on designer personality. Some professionals have a natural eye for it, having a so-called "sense of style." This is not the same as "fashion sense" – knowing what is in vogue – but a feel for line and design. The lack of dress-sense could make the garment uncompetitive, though the garment fitting is perfect. Thus all kinds of garments must have enough aesthetic quality level. All kinds of garments must have enough aesthetic quality level.

The problem of the quantities evaluation of the beauty can be traced back to the work [1] where the formula of the calculation of the beauty level was described. Then works [6, 12, 13] can be considered as a base for the actual research of the aesthetic garment quality. In the paper [6] characteristics of the aesthetic garment quality were described. In the work [13] it was proposed to use the etalon garment samples to evaluate these characteristics. Slavinska [14] proposes a list of criteria for the evaluation of information arrays in apparel design process.

According to recommendations [6, 13, 14] indexes list of the aesthetic garment quality was compiled by Kuleshova in [8]. The method of improving of the artistic perfection of dress was developed in [9]. The method is based on the systematization of compositional elements for making a harmonious shape

of dress. This work was extended in [10], and the method of early diagnostic of the aesthetic garment quality was developed.

2. METHODS

Calculated weighting factors of the indexes are represented in the table 1.

Table 1. Weighting assignments for the indexes of the clothing harmonisation

No	Group index	Subgroup index	Weight	Index	Index notation	Weight
1	Proportion	$K^{pr.}$	0.318	Ratio of the garment size to a consumer height	$K_1^{pr.}$	0.107
				Proportional allocation of the constructions lines	$K_2^{pr.}$	0.105
				Proportion of size and allocation of the parts of the garment	$K_3^{pr.}$	0.106
2	Color scheme of the garment style	$K^{col.}$	0.315	Concordance colors to the fashion trends	$K^{col.ft.}$	0.110
				Harmony of the materials colors	$K^{col.har.}$	0.116
				Concordance of colors and usage circumstances	$K^{col.us.}$	0.053
				Concordance of colors and consumer's appearance	$K^{col.con.}$	0.036
3	Fitting of garment	$K^{fit.}$	0.196	Fitting of garment	$K^{fit.}$	0.196
4	Scale	$K^{sc.}$	0.171	Concordance of the garment size and human body size	$K_1^{sc.}$	0.112
				Concordance of the whole garment size and the size of its parts	$K_2^{sc.}$	0.059
Assigned weightings total:			1.000	Assigned weightings total:		1.000

The weight of indexes would be used for a calculation the level of clothes harmonisation.

The developed method of the evaluation the level of clothes harmonization must be performed according to the sequence of actions that is follow:

1. The first step of the method is a consumer's appearance identification.
2. Geometric silhouette of garment must be chosen from the catalogs of fashionable geometric shapes of clothing silhouettes. Then a designer makes a decision if the chosen shape of the garment is to be adapted. The shape could be altered if the individual figure and its harmonized prototype are almost the same. Otherwise, it would be better to design the desired shape of the garment according to the consumer's appearance.
3. Art and design parameters for the garment must be chosen from the matrix that includes preferred parameters of dresses for fashionable figures on the next step of the method. Adaptation of the chosen parameters is to be done only if they are entirely different from the real ones.

4. Then a designer puts a consumer's photo and a sketch of desired dress into the grid of harmonic segmentations that was specifically developed by authors. After that the design parameters of the dress must be altered according to the grid limits.
5. An adequate choice of clothes color palette for the person's coloring is the next step of the method.
6. Finally, computing of the indexes of clothes harmonisation by the formulas that are shown in the table 2 finishes the process of evaluation.

Table 2. Sequence of the evaluation the level of clothes harmonisation

№	Index	Formula
1	Proportion	$K^{pr} = K_1^{pr} G_1^{pr} + K_2^{pr} G_2^{pr} + K_3^{pr} G_3^{pr}$
1.1	Ratio of the garment size to a consumer height	$K_1^{pr} = D_{gar} / H$
2	Color scheme of the garment style	$K^{col} = K^{col.f.t} G^{col.f.t} + K^{col.h} G^{col.h} + K^{col.us} G^{col.us} + K^{col.con} G^{col.con}$
3	Fitting of garment	K^{fit}
4	Scale	$K^{sc} = K_1^{sc} G_1^{sc} + K_2^{sc} G_2^{sc}$
4.1	Concordance of the garment size and human body size	$K_1^{sc} = S_{gar} / S_{body}$
4.2	Concordance of the whole garment size and the size of its parts	$K_2^{sc} = S_{part} / S_{gar}$
The level of harmonisation of clothes		$K^H = \sum_{j=1}^n K^j G_j$

In the table 2:

D_{gar} – length of garment, cm;

H – consumer's height, cm;

K_2^{pr} – proportional allocation of the constructions lines;

K_3^{pr} – proportion of the size and allocation of the garment parts;

$K^{col.f.t}$ – concordance the colors to the fashion trends;

$K^{col.h}$ – harmony of the materials colors;

$K^{col.us}$ – concordance the colors and usage circumstances;

$K^{col.con}$ – concordance of the colors and consumer's appearance;

S_{gar} – surface area of garment, cm²;

S_{body} – area of a human figure projection with clothes on it, cm²;

S_{part} – total surface area of decorative parts of the garment, cm²;

K^j – value of harmony index j ;

G_j – weighting factor of index j ;

n – a number of the indexes.

3. RESULTS AND FINDINGS

3.1. Consumer’s appearance identification

Three photos of a consumer must be used as a base for the consumer’s appearance identification: front, back, and side. Information about the consumer includes a dataset of the dimensional characteristic of the morphological features, data about the figure shape, about specifics of face and neck, and information about a person’s color type.






The results of the work are advisable to consider with an example of the drafting a dress design for a particular consumer: a woman, who is 22; height – 170 cm; bust – 92 cm; hips – 100 cm; color type is spring.

In order to perform the analysis of standard and real figures of the consumers they were divided into three groups: harmonious figures and ideal figures; harmonized figures that are not significantly different from the ideal ones, and require only the adaptation of the fashionable garments; inharmonious figures that require a special development of the clothes designs. A harmony group of individual figure can be computed with the method that was described in the work [11]. Besides that, the way of garment alteration can be determined by this method. A standard figure (height – 170 cm; bust – 92 cm; hips – 100 cm) was tested by the method that was described in the work [14], and a ratio of the body sizes of standard and harmonious figures was considered as the figure type “S-S-M” that means “Small – Small – Medium”.

3.2. Geometric silhouette and design parameters for the garment

As a result of the individual consumer’s appearance identification the design modifications of women dresses were proposed and presented in the table 3.

Table 3. The design alternatives of women dresses for the individual consumer

Style	Silhouette	Geometric shape	The division surface	shoulder	neckline design	Decision on the bust line	on the waistline	hips	The color and texture of the material	Location structural and decorative elements	Length of garment
All	Semi-fitting 		Vertical  Diagonal  Fantasy	not accented		accented	accented	not accented	Color palette of summer color type	At the top of the possible finding accented elements	Above the knee or maximum length

3.3. Choosing the geometric silhouette of the garment

Fashion mega portal «first VIEW» [17] was used to carry out current study. This portal allows working with digital photos of the collection shows. Modern European women's dresses (seasons “spring-summer” 2016) were selected as an object for the study. Six Fashion Houses were selected for

the research: Alexander McQueen (UK), Chanel (France), Dior (France), Valentino (Italy), Gucci (Italy), Slava Zaitsev (Russia). The Fashion Houses meet the following criteria:

- the history of the House has over ten years;
- the Fashion House is famous, and it could be claimed as a “trendsetter”.

At the first stage of current research, over 250 images (about 50 models in each collection) were analyzed and presented graphically as the geometric symbols (GS). Models were located in a united modular grid in the full growth. The symmetry of the human figure was taken into account, but specific characteristics of dress shape (a color, sewing lines, decorative details, fabrics properties, etc.) have been ignored. It allowed tracing the process of forming a dress shape by allocating the main feature of the dress (figure 1).

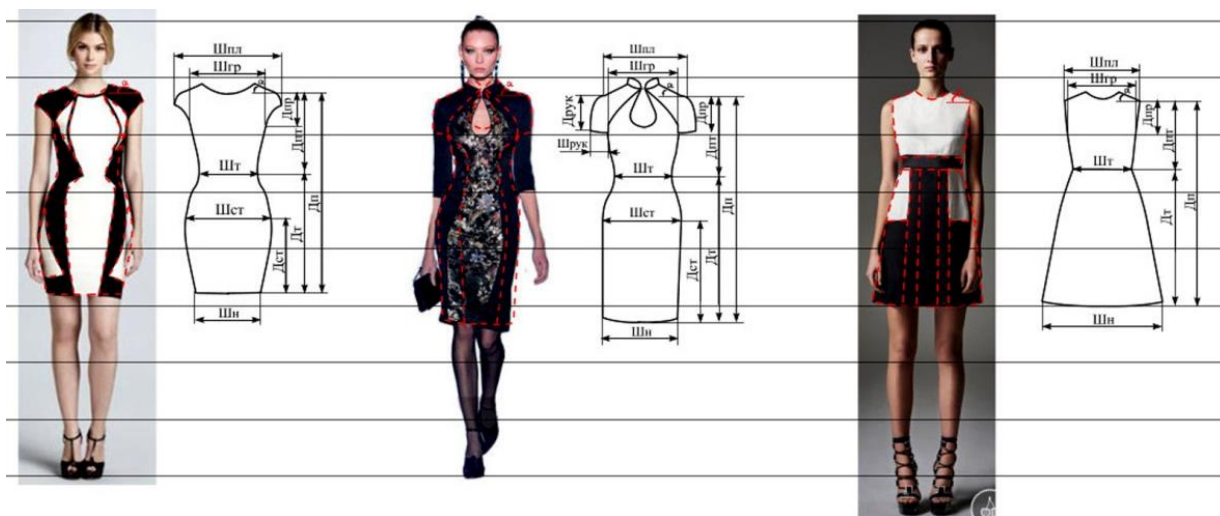


Figure 1. Examples of the graphical analysis of visual projection structure of the dresses

Quantitative analysis of the evolution of dresses shapes means that the percentage of each tendency in collections of the current year or season is to be determined. Quantitative analysis is represented in the table 4.

Table 4 – Statistical analysis of the geometric symbols of modern European women's dress shape (2016)

№	Fashion House	Number	Percentage of dresses with the												
			basic shape (BSh), %				derivative shape (DSh), %								
			BSh1	BSh2		BSh3	DSh12, DSh21		DSh13, DSh31		DSh23, DSh32				
1	Alexander McQueen	32	8.0	15.0	15.6	21.0	1.8	1.6	5.0	2.0	-	20.0	2.4	7.6	-
2	Chanel	47	18.1	11.3	21.1	14.8	4.9	2.1	6.8	2.9	2.7	6.4	3.5	5.3	-
3	Dior	35	6.8	11.0	26.0	19.0	2.2	-	2.2	1.6	0.4	20.8	4.6	5.2	0.2
4	Valentino	49	15.2	20.2	26.6	18.0	2.6	2.0	2.0	2.4	1.0	11.0	1.4	1.6	-
5	Gucci	37	12.0	8.6	23.8	9.4	1.8	2.0	3.4	9.0	2.6	18.0	4.0	4.8	0.6
6	Slava Zaitsev	51	14.9	17.3	12.7	20.7	2.2	7.6	3.6	3.4	-	13.1	0.4	3.6	0.4

Geometric symbols of basic and derivative shapes of the costume could be used as the input data for the apparel design. The main basic shape in the current period is the X-shaped dress (BSH2). This shape is presented on the female figure (fig. 2) as a complex model, which includes contours of the garments. Each garment has a certain type with the correspondent shape.

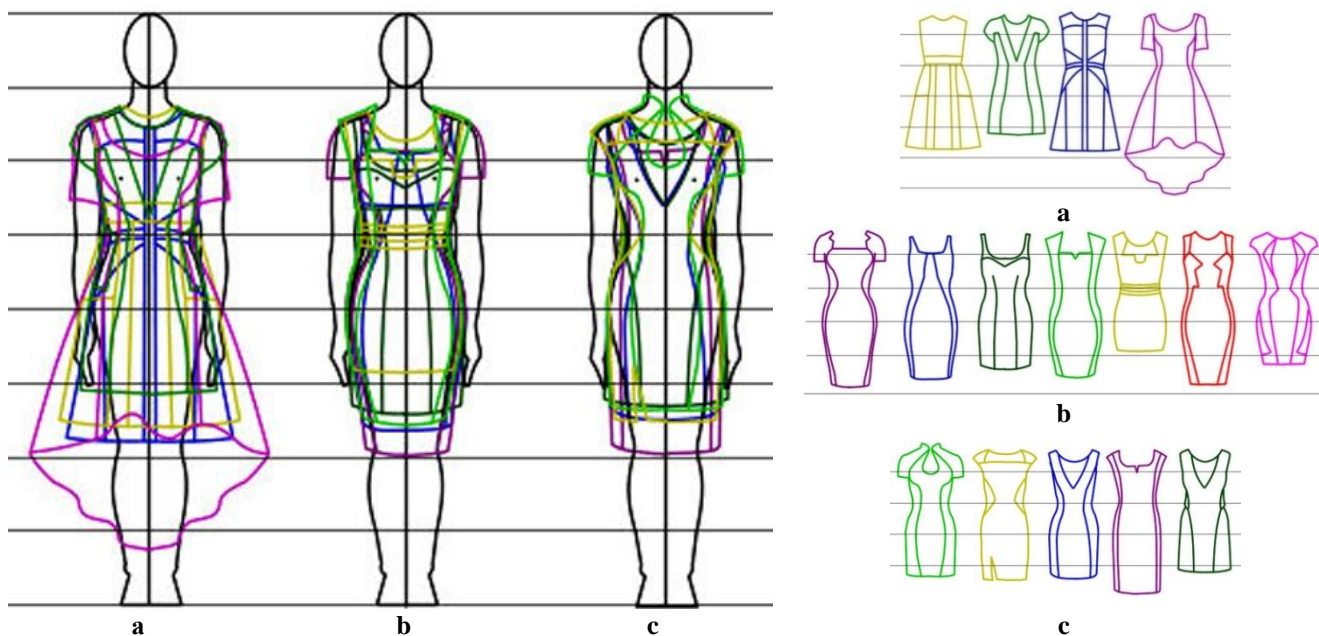


Figure 2. Geometrical images of the dominant shape: a) shape 1; b) shape 2; c) shape 3

At the next step of the research the photos of specific dresses (models from 1 to 6) were placed on consumer's photo (figure 3).

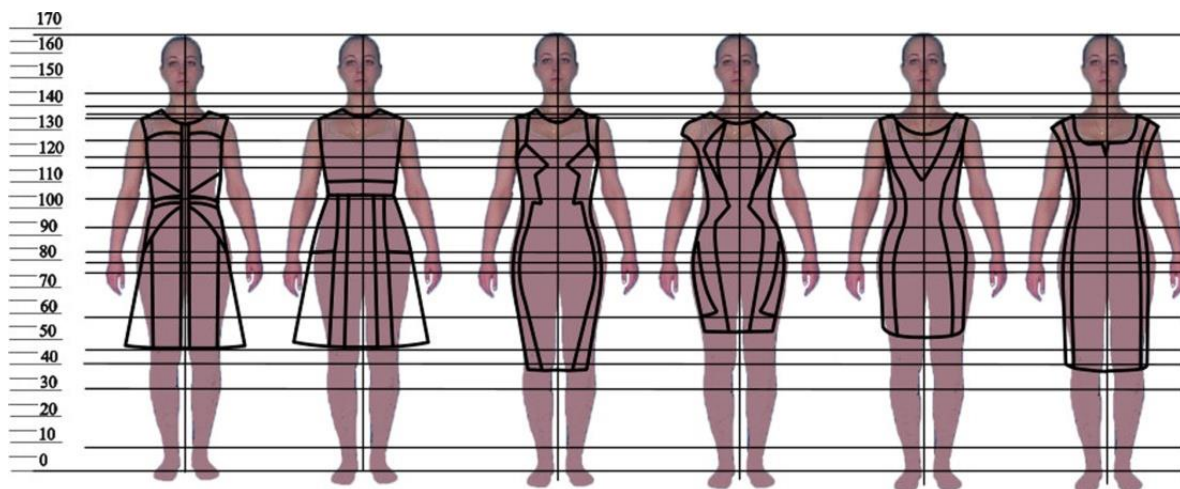


Figure 3. Examples of dresses photos on the consumer's photos

3.4. Harmonization of the garment

The harmonization of the garment must be performed in accordance to the following order. The consumer's photo and the sketch of the dress are to be placed into the grid of harmonic segmentations as it shown on the figure 4.

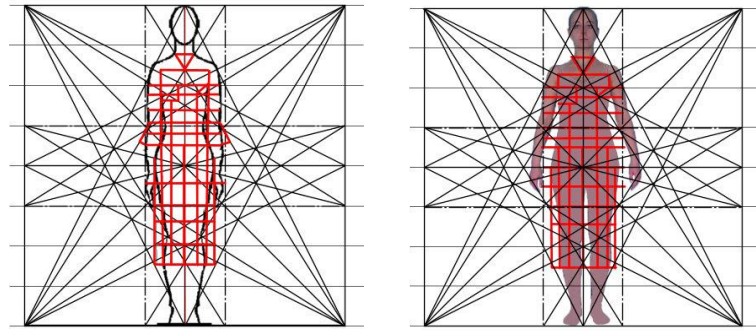


Figure 4. Preferred limits of the harmonic segmentations for the type of figures “S-S-M”
 After that, the design parameters of the dress must be altered according to the grid limits. Foremost it is necessary to begin with alteration of the garment length. Then the width parameters must be changed: the shoulders line as well as the hem line. These alterations are shown on the figure 5. The degree of fit at the waistline could also be adjusted. Finally, a designer changes the form of neckline, and the specifics of decorative parts.

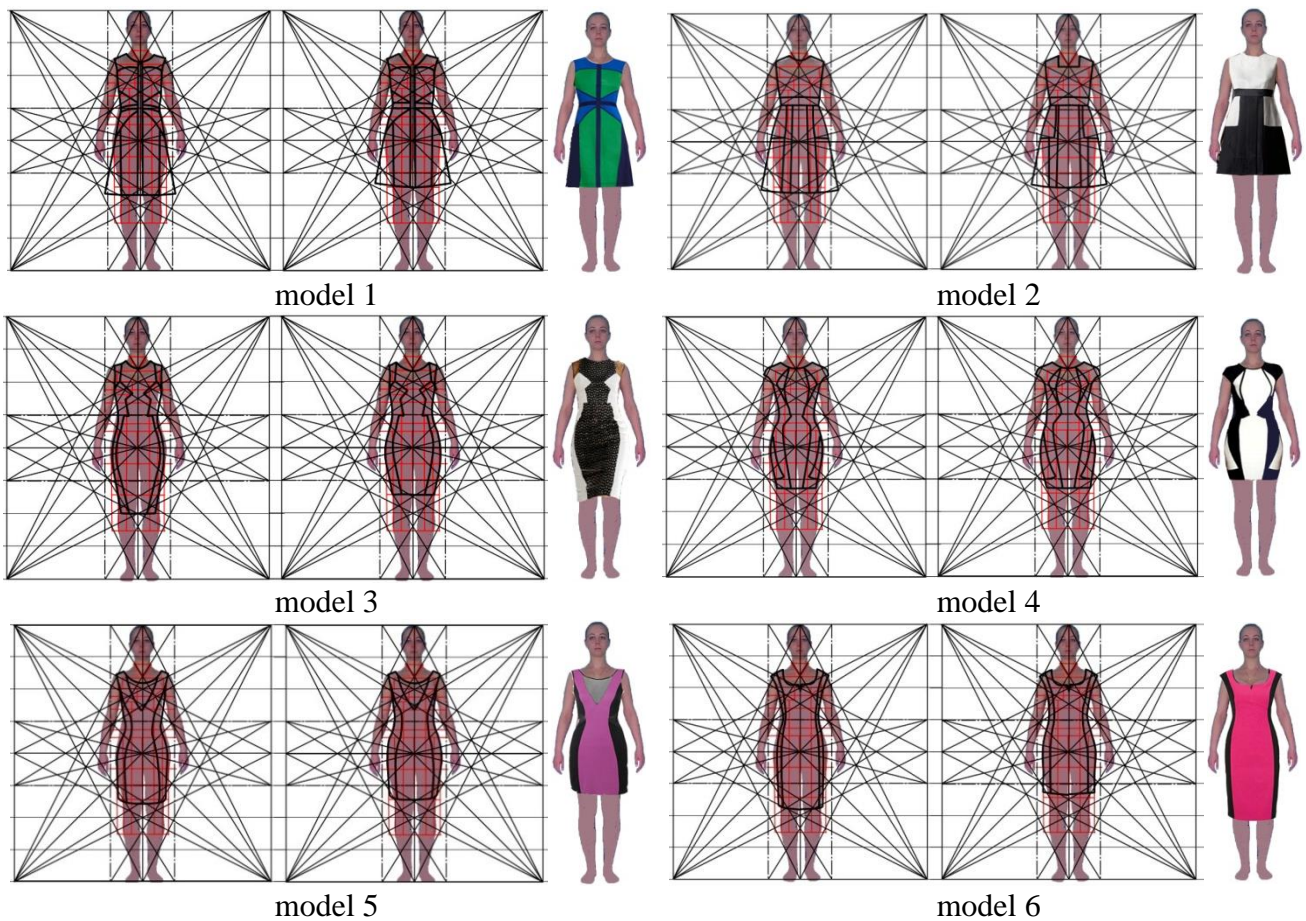


Figure 5. Shape harmonization and color selection for the particular consumer

In the table 4 it could be traced the difference between the harmonized and the fashionable dress that was presented in the fashion magazine (online catalog, fashion portal, etc.).

Table 4 – Comparison of composition parameters

Model	Fashionable dress	Harmonized dress
1		
2		
3		
4		
5		
6		

3.5. Selection of the clothes color palette

According to the recommendations for colors of the consumers' types [2, 4, 5, 15], the lists of the recommended colors for the "spring" consumer color type were compiled. The specifics of the color type are shown in the table 5, and in the table 6 there is the list of the recommended colors.

Table 5. Personal coloring for the consumer

Consumer type	Hair color	Skin color	Eye color
Spring	Golden brown	Golden beige	Gray

Table 6. Recommended colors for "spring" consumer type (monochrome harmony)

Consumer type	Color model	Recommended colors for the consumers' types, %				Recommended fashionable colors for the consumers' types, %					
		red	green	blue	achromatic	red	pink	green	blue	white	black
Spring	C	0	27...86	31...84	5...35	0	25	48	36	0	0
	M	45...100	0...24	1...28	5...20	65	60	0	6	0	0
	Y	25...80	61...100	2...32	20...55	50	0	31	9	0	0
	K	0	0...12	0...2	5...30	0	0	0	0	0	100

In the table 8 the CMYK color model was used according to the recommendations [3]: C – Cyan, M – Magenta, Y – Yellow, K – Black.

3.6. Evaluation of the level of clothes harmonization

On the final step of the method the values of the indexes are to be calculated (according to the table 2). The results of the calculations are shown in the table 7.

Table 7. Values of the indexes of the clothes harmonisation

№	Index	Value for model					
		1	2	3	4	5	6
1	Proportion	0.264	0.259	0.268	0.257	0.257	0.274
2	Color scheme of garment style	0.315	0.245	0.245	0.245	0.260	0.285
3	Fitting of garment	0.196	0.196	0.196	0.196	0.196	0.196
4	Scale	0.125	0.125	0.123	0.121	0.121	0.128
	Complex index	0.90	0.825	0.832	0.819	0.834	0.883

The outfit number 1 may not be altered anymore because the calculated value of the complex index of the clothes harmonization is high enough. Others dresses are advisable to alter.

4. CONCLUSION

The obtained information can be used as a basis for the formal methods for the evaluation the aesthetic garment quality. Besides that the results could be provided for the development of an expert system that would be intended for make a decision about the needs for the adjustments of a garment's appearance. The weighting factors that were obtained in the present work can be use for the evaluating of the harmonization level of any garment types.

5. ACKNOWLEDGMENT

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6. REFERENCES

- [1]. Azgaldov, G. G., & Azgaldova L. A. Quantitative evaluation of quality. (Qualimetry). Bibliography. Moscow, Standard, 1971.
- [2]. Freer, A. How to Get Dressed: A Costume Designer's Secrets for Making Your Clothes Look, Fit, and Feel Amazing. New York, Ten Speed Press, 2015.
- [3]. Gill, M. Color Harmony: Jewels. Rockport Publishers, 2000.
- [4]. Henderson, V., & Henshaw, P. Colour Me Beautiful: Colour me confident. London, Hamlyn, 2006.
- [5]. Jackson, C. Color Me Beautiful. New York, The Random House Publishing Group, 1987.
- [6]. Koblyakova, E. B., & Ivleva, G. S. Designing clothes with CAD elements: study guide. Moscow, Light Industry press, 1988.
- [7]. Kuleshova, S. G. Development of the design principles of harmonious appearance of the consumer by visualization of the virtual system "human-clothing". Interuniversity collection "Scientific notes", No. 34, 2011, pp. 148-153.
- [8]. Kuleshova, S. G., & Slavinska, A. L. Method of complex assessment of aesthetic quality in clothes design. In Shalapko Y., Wyszowska Z., Musial J., Paraska O, Study of problems in modern science: new technologies in engineering, advanced management, efficiency of social institutions. Monograph. Bydgoszcz: Poland, 2015, pp. 318-327.
- [9]. Kuleshova, S. G., & Tumochko, K. R. Developing method of improving artistic perfection of costume, Herald of Khmelnytskyi national university. Technical science, No. 6, 2012, pp. 100-105.
- [10]. Kuleshova, S. G., & Tumochko, K. R. Development the method of early diagnosis of aesthetic garment quality, Young scientists, No. 8, 2014, pp. 287-293.
- [11]. Medvedeva, T. V. Development the foundations of the quality formation in clothing design: Monography. Moscow, GOUVPO "MGUC", 2005.
- [12]. Nikolaeva, T. V. Tectonic forming of suit: Textbook. Kyiv. Aristei, 2011.
- [13]. Parmon, F. M. Costume composition: study guide. Moscow, Light Industry press, 1985.
- [14]. Slavinska, A. L. Basis of a modular clothes design: Monography. Khmelnytskyi, Khmelnytskyi national university, 2007.
- [15]. Spillane, M. & Sherlock, Ch. Color Me Beautiful's Looking Your Best: Color, Makeup and Style. Lanham, Maryland, Madison Books, 1995.
- [16]. Zakharkevich, O. V., Kuleshova, S. G., & Shvets, G. S. Determination of fabrics properties for reversible garments. TEXTEH VII International Conference Proceedings, Bucharest, Romania, Vol. 7, 2015, pp. 78-88.
- [17]. First VIEW. Retrieved 10. 8. 2016. Available at: <http://www.firstview.com/>